to take such a journey into the future cannot do better than make it under Mr. Sutherland's guidance. He points out clearly, and in many cases we think rightly, what are likely to prove the most important inventions in the twentieth century. It is, perhaps, necessary to state that the author counts inventions as belonging to the period during which they come to fruition rather than to that in which the original idea is first conceived; some such limitation is certainly necessary, otherwise there will never be wanting those who will be ready to prove that there is nothing new under the sun, and that the germ of the *Turbinia* was contained in Noah's Ark.

A great deal of space is justly given to the generation, storage and distribution of power. This is becoming one of the most pressing problems of the immediate future, as is evidenced by the number of big power schemes now on foot. We already see the new industries requiring much energy congregating around large sources of water-power. This source has only just begun to be seriously tapped, and for a time, at least, we can regard it as an almost inexhaustible supply of cheap power. But as progress goes on, as these industries develop and increase, water-power will no longer remain so cheap, for land will get more valuable in the neighbourhood of suitable waterfalls, and the available power will be, sooner or later, all in use even though the falls possess so large a reserve as Niagara. We shall then have to turn to other sources as yet untouched; it is to the winds and the waves that we shall go for help, according to Mr. Sutherland. Such sources as these, however, are intermittent and can only be useful when a thoroughly satisfactory means of storing power has been found. For this we must look to the electric accumulator, especially as the electrical seems to be the most suitable method of transmitting power. The author enters into detail at considerable length concerning the inventions by means of which the wind and wave power will be "cabin'd, cribb'd, confin'd," and here we must confess we do not think him so convincing. Throughout the book there is a tendency to enter into too minute details; it will be long before many of the problems are seriously attacked, and by the time they are it is probable that we shall have better means of attacking them than are now at our command.

Transport, both by sea and land, is another very pressing question. It is being very generally recognised that some method of relieving the congestion of the towns must be found, and it is probable that this will be most readily effected by increasing the ease of locomotion, though the transmission of power, by taking the work to the labourer in place of bringing the labourer to the work, will no doubt be a great help. Mr. Sutherland's schemes for increased facility of transport by road and rail are, many of them, suggestive and will be read with interest.

Space forbids our following Mr. Sutherland further into the coming century. We are inclined to disagree with his predictions concerning the future of music, art and many of the minor applications of electricity. We do not, for example, believe that wireless telegraphy will ever be used for lighting (and we suppose laying) the morning fire, that the housemaid of the future may not have to come down to a cold room. But, on the whole, the book takes a comprehensive and broad survey of the probable progress of invention, and is well worth careful reading.

VERTEBRATE HISTOGENESIS.

Lecithoblast und Angioblast der Wirbelthiere. By Wilhelm His. Abhandlungen der math.-phys. Classe der Kgl. Säch, Gesell. der Wissenschaft, vol. xxvi. pp. 173-328; 102 figures. (Leipzig: 1900.) Price Mk. 8.

THIS memoir is the latest and largest of a series, published by the author in the *Transactions* of the Saxon Academy of Science. Its title indicates that it treats of histogenetic studies in those parts of the developing germ which are concerned in the formation of the blood-vessels and blood, and in the elaboration and assimilation of the yolk-mass. The table of contents at the close reveals a very much wider sphere of research than that suggested by the title. It is, indeed, a treatise on histogenesis. Prof. His himself describes it as a sort of histological testament. Like some other documents of the like name, it contains very varied provisions. Almost all the phenomena witnessed in the early development of the embryo are treated of at greater or less length, the first blood-vessels and blood and the changes undergone by the yolk and its components receiving special attention. The work is full of detailed observations, and these are described at the hand of a complex terminology.

Following the plan of certain of his previous studies, the author has departed from the usual custom of gathering the illustrations into plates. And there can be no question that the numerous woodcuts woven into the text add greatly to the usefulness of the memoir. If the work contain no strikingly novel or fundamental discovery, it may none the less be described as a valuable storehouse of exact observations for the use of future investigators.

One of Prof. His's most remarkable recent discoveries—originally published in an earlier study—is again dealt with in connection with the yolk-germ or lecithoblast. It is that, underlying the so-called amitotic or direct division of the yolk-nuclei or merocytes, there is a modification of ordinary mitosis, *i.e.* a pluripolar form. This identification is probably to be regarded as among the greatest real advances in cytology of recent years. For does it not bring the unknown and incomprehensible into relationship with the known?

It may, however, be doubted whether, as the author maintains, the products of pluripolar mitosis—if the process attain any particular complexity—are ever able to revert to the bipolar form; indeed, whether cells which have got entangled in this complex network are ever able to emerge therefrom as normal entities. Connected with this question there is also the curious amœboid mode of yolk-annexation by certain cells described and figured in the memoir. Rueckert demonstrated some years ago—and his observations have recently been fully confirmed by Beard—that a tendency to free themselves from the yolk is often one of the characteristics of cells undergoing pluripolar mitosis. Like the latter process, that recorded by His as yolk-annexation would therefore be classifiable as a degenerative phenomenon.

The task undertaken in these histogenetic studies was an immense one—even for an investigator of the energy and talents of Prof. His—covering, or attempting to do so, a large portion of the field of developmental mechanics. How is it that certain structures arise at certain, usually

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predestined, times in particular places, and only there and out of certain cells alone? The simplest answer, and that long made the basis of almost all embryological research, has been that out of three primary layers of cells the embryo and all its parts take their origin. The working out of the details has largely been the labour of embryological investigation of the past fifty years.

The wealth of observation contained in the present memoir furnishes ample evidence that after all progress has been exceedingly slow.

We still do not know why a certain cell becomes a gland-cell, another a ganglion-cell: why one cell gives rise to a smooth muscle-fibre, while a neighbour forms voluntary muscle. The prolonged researches of Prof. His, often of far-reaching import, and always carried out with exceeding care, afford typical instances of investigation on the lines of development by epigenesis. The author himself states that as a solution of all, or even many, of the great problems of histogenesis they have disappointed his hopes.

It would appear to be quite possible that numbers of embryological problems incapable of any fundamental solution may exist. The range of human mental vision may have been reached with the limitations of microscopic lenses. However that may be, it is daily becoming more apparent that epigenesis with the three layers of the germ furnishes no explanation of developmental phenomena.

"There is no coming into being!"—"Es giebt kein Werden"—wrote Haller long ago. And this is emphasised bv Weismann when he informs us that an epigenesis is an impossibility. But there is an evolution or unfolding. Development, even in lowly forms of animal life, is a complicated study. With three germ-layers as its basis no advance in its interpretation is possible. Nothing like all the cells present at the close of the egg-cleavage are destined to share in the formation of the future embryo. Many of them—often the majority of them—are merely larval or transient in character. Still others, the greater number of those remaining, are charged with the duties of handing on the "stirp," in Galton's sense, to future generations.

The chain of life from generation to generation is of exceeding intricacy. The unravelling of the tangle and the true interpretation of the many important links in it both serve to increase the magnitude of the embryologist's task. The day is not yet when this approaches completion.

OUR BOOK SHELF.

The Scientific Memoirs of Thomas Henry Huxley. Vol. iii. Edited by Sir Michael Foster and E. Ray Lankester. Pp. xi + 622. With thirty plates, maps and text illustrations. (London: Macmillan and Co., Ltd., 1901.) Price 30*s*. net.

THIS magnificent volume will be to the working naturalist the most welcome of the three now published. It contains 38 memoirs, papers and addresses, covering, in all, 608 pp., as against 50 with 508, and 37 with 591 for volumes i. and ii. respectively. It embodies the scientific work of Huxley at his best. As memorable may be cited the great memoir on the bird's palate, which marked an epoch in comparative osteology; and that on the ossicula auditus, in which recent research has discovered a hidden treasure, and of which one of the leading conclusions, viz. that of the primary nature of the union between the hyoid and the columella auris, has but lately been shown (long opposition notwithstanding) to be developmentally confirmed. Particularly noteworthy are the series of memoirs and papers upon the Dinosauria, and the series of addresses and philosophic memoirs on the ethnology, archæology and distribution of mankind in various parts of the globe, which will ever rank among their author's best achievements.

As regards the general get-up of the book, the editors have spared no pains to render perfect their labour of loyal devotion. One or two of the plates are, perhaps, a little lacking in sharpness—printed, in the copy before us, a little lightly—but all that is important is definable.

It is with a feeling of considerable relief that we note the incorporation of the Geological Survey memoir upon the Structure of the Belemnitidæ; for this, in respect to certain details, contains the most accurate description to-day available, and will ever hold its original high place in the literature of zoology. Our expression of relief is due to the fact that this great essay, together with five of those afore-mentioned in anthropology, the two papers upon the lowly plant organisms which close the present volume, and one or two other items, were entirely omitted in the first-published table of "contents," put into circulation on the announcement of the work. The reason for this is not difficult of demonstration, and while we would convey to the editors our gratitude for having, as their labour advanced, made perfect the definitive list up to the period embraced by the present volume, we would remind them that, so far as the said "contents" table affects the volume to come, the great Survey Memoir on the Elgin Crocodilia, the Rede Lecture on Animal Forms, delivered at Cambridge in 1883 and duly reported at some length in our own pages (NATURE, vol. xxviii. p. 187), with the "Further Notes on Hyperodapedon" (*Quart. Journ. Geol. Soc.*, vol. xliii., which was the last zoological paper that issued from Huxley's hands, were similarly not included.

In the production of this monumental series of volumes, publishers and editors are incurring a debt of gratitude on the part of the present and future generations, and carrying out a labour of love in a spirit becoming in its dignity the original memoirs themselves.

Fact and Fable. By Effie Johnson. Illustrated by Olive Allen. Pp. 117. (London: Chapman and Hall, Ltd., 1901.) Price 6*s*.

THIS is a pleasingly-written and attractive little book, containing a series of short tales and sketches, the first and largest of which relates a boy's visit to an ant-hill, his adventures, and what he found there. Another tale relates the adventures of a young bee; while most of the others consist of allegorical or symbolical presentations of various phases of human life. As the authoress admits, the descriptions of the events in ants' nests are taken from different species, and the large queen is a Termite. But the story may serve to interest young readers in ant-life and lead them to read other books on the subject.

Science and Mediaeval Thought. By Prof. T. Clifford Allbutt, F.R.S. Pp. 116. (London: C. J. Clay and Sons, 1901.) 2*s*. 6*d*. net.

THE brilliant character of the Harveian oration delivered before the Royal College of Physicians last October by Prof. Clifford Allbutt could be judged by the abridgment which we published a few days after the delivery of the address (vol. lxii. p. 630, October 25, 1900). The complete address is given in the volume before us, with a few additions and notes, and we cordially commend it to every one who desires to read an inspiring account of the evolution of mediæval into modern thought.

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